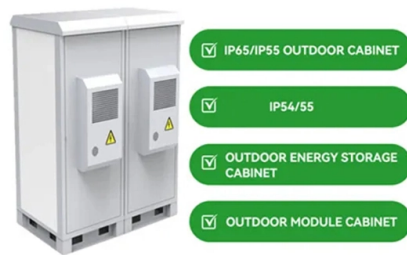


Fiber Optic Multidimensional Intelligent Sensing



Overview

We comprehensively survey the state of the art in SDM-based OFS, detailing the operating principles and applications of multi-core fibers (MCFs) for ultra-dense sensor arrays and 3D shape sensing, as well as few-mode fibers (FMFs) for mode-division multiplexing and enhanced. We comprehensively survey the state of the art in SDM-based OFS, detailing the operating principles and applications of multi-core fibers (MCFs) for ultra-dense sensor arrays and 3D shape sensing, as well as few-mode fibers (FMFs) for mode-division multiplexing and enhanced. This review argues that the synergistic convergence of space-division multiplexing (SDM) and artificial intelligence (AI) represents a paradigm shift, enabling a new generation of intelligent, high-dimensional sensing networks. We comprehensively survey the state of the art in SDM-based OFS. Understanding this revolution requires grasping fiber sensing's principles: External physical parameters (temperature, pressure, strain, etc.) interact with light signals in optical fibers, altering intensity, phase, wavelength, or polarization. This paper presents a comprehensive review of AI-enhanced OFS.



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In essence, AI-SDM fusion transforms fiber-optic sensing from static signal demodulation to intelligent, adaptive, and predictive sensing systems capable of self-calibration, environmental adaptation, and

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Integrated sensing and communication in an optical fibre

3, Xinyu Fan 4, Abstract The integration of high-speed optical communication and distributed sensing could bring intelligent functionalities to ubiquitous optical fibre networks, such as urban structure

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AI has significantly enhanced signal processing in optical fiber sensors by improving data analysis, increasing accuracy, and accelerating decision-making. AI techniques facilitate the effective

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Convergence of Multidimensional Sensing: A Review of AI-Enhanced

This review argues that the synergistic convergence of space-division multiplexing (SDM) and artificial intelligence (AI) represents a paradigm shift, enabling a new generation of intelligent,

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